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Combining research methods in policy and governance: taking account of bricolage and discerning limits of modelling and simulation

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ABSTRACT

We present a perspective on combining research methods in policy and governance which starts from an understanding of governance as the result of a double bricolage: an organizational or institutional bricolage, and a bricolage of knowledges and associated methods. We develop a typology of common ways to combine methods in governance, distinguishing between nesting, framing, mixing, specifying, and specializing, where not all methods can be combined at all times and sometimes different modes of combining methods can coexist. We reflect on the possibilities and limits of combination and give the concepts of boundaries and couplings central place in this reflection. The perspective clarifies the attractiveness of integrated systems of quantitative methods purporting to enable simulation and steering, while highlighting a new set of risks and boundaries for such approaches.

1. Introduction: research and method in policy and governance

Governance requires knowledge in many forms. Some of these knowledges we can call research, and research requires some sort of method. As governance is complex, involving many actors, institutions, forms of knowledge, it is most likely that different methods are combined, either in one particular report or study, or in the interplay of studies preceding important decisions. The more departments and their experts are involved, the more consultants and academics, the more complex and unpredictable this interplay between knowledges and associated methods will be.

Despite this, one can observe a few clear trends in recent decades. While modernist, rational, comprehensive, long-range planning might be desperately out of fashion, and while more disciplines, more methods, more forms of local knowledge are formally accepted in governance arenas around the world, the dominance of a narrow set of methods cannot be ignored. Quantitative methods dominate, and, despite many assertions of the opposite, 'trust in numbers' never has been so high (Latour, 2004; Miller & Fox, 2015). Moreover, a particular set of methods, seemingly dismissed in the past as overly mechanistic, came back with a vengeance: integrative,

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computational long-range modelling and simulation.

In the past decennia modelling and simulations have been used to analyse, among others, market dynamics (e.g. MacKenzie, 2009), traffic flow (Hoogendoorn & Bovy, 2001), land use (Dorin & Joly, 2020) or various questions related to climate change and environment (Edwards, 2010; van Beek, Hajer, Pelzer, van Vuuren, & Cassen, 2020); recently they have enjoyed renewed interest in the context of the SARS-Cov-2 pandemic, in which scientists have tried simulate disease transmission by modelling the interactive behaviour of agents (e.g. Kuhbandner et.al., in this special issue). The current popularity of modeling and simulation can be understood not only as a response to current overriding concerns such as climate change adaptation, pandemic control, economic restructuring and biodiversity conservation, but also an attempt to accommodate the growing internal complexity of governance, where numbers carry the promise of synthesis and integration, and the possibility of governance for the long term, without getting embroiled in the uncertainty of the future and the always contested articulation of common goods and shared goals.

In this paper we point to the limitations of an exclusive focus on integrative, computational modelling and provide a defense of methodological pluralism and an openness to combining different methods, including modeling in governance. Governance requires different types of knowledges and hence different methods of collecting and assessing evidence. Our stance is based on the idea that models and simulations, like other methods of collecting and assessing evidence, are hybrid, in that they are both tools of evidence as well as tools of government (e.g. Lascoumes & Le Galès, 2007; Dorin & Joly, 2021). On the one hand, we conceive of methods as tools to guide observation, conduct reasoning and collect evidence (Haverland & Yanow, 2012). Given the complexity of most research topics and the unpredictable elements in research process, we make a plea for an open, reflexive approach to research methods (see also Van Assche et al., 2021a) and are coming out against methodological tribalism because "different methods shine under different lights, and generally have different limitations (e.g. depth versus breath, singularity versus generalizability, site-based study versus drawing on a wider range of respondents, and so forth)" (Lamont & Swidler, 2014, 155). Methods should hence be purposefully chosen - and combined - based on the needs of the questions or problems at hand. On the other hand, we conceive of methods as tools of governance. As current governance systems have to deal with complex and ever shifting problems in which different actors and institutions are involved they have to be able to collect and assess different types of evidence and combine different research methods and knowledges (e.g. Bannink & Trommel, 2019). In a situation in which no individual, team, department, organization or country is able to develop a new cancer drug, take decisions on emission norms, or regulate digital markets, it becomes crucial to combine the diverse knowledges of many different governance actors.

In line with this double understanding of methods, we argue that it is useful to understand governance as the result of a double bricolage: an organizational or institutional bricolage, and a bricolage of knowledges and associated methods (cf Rogers, 2012). Firstly, governance is the outcome of a process of "institutional bricolage", a process by which actors "consciously and unconsciously draw on existing social and cultural arrangements to shape institutions in response to changing situations" (Cleaver, 2001: 26). This, of course, implies that governance is often a mix of different types of institutions, including formalised arrangements based on explicit organisational structures, contracts, and legal rights, as well as more informal and traditional ways of coordinating action (Cleaver, 2001; 2012). It also means that governance cannot be entirely coherent. The reasons are partly the difference of perspectives emerging in and used in governance, partly the complexity of the world and the imperfect attempts to govern it, and partly they are strategic, i.e. the deliberate use of a version of reality to gain in and through governance. That gain can be private, or understood as public, but the strategic construction and use of knowledge remains (Flyvbjerg, 2001). Secondly (and as already explained), a complex and heterogeneous governance configuration requires a bricolage of methods and knowledges which play out in governance. In a world which looks ever more complex, various couplings and combinations of different knowledges and types of evidence are necessary to deal with new challenges and an ever-changing environment.

While there is literature on the bricolage, the mixing and combining of different research methods (Biesta, 2010, Denzin, 2010)– e.g. the extensive debate on 'mixed-methods'-, as well as on the bricolage of institutions (e.g. Cleaver, 2001, 2012), this article is one of the first to explicitly couple both ideas of bricolage. We argue that this 'double bricolage' is a natural state of affairs in politics, administration, but that this natural state tends to be hidden by modernist discourses on policy and administration. While governance systems generally mix different types of institutions, knowledges and methods, a myth of unity appeals for obvious reasons to modernist state builders and administrators, as it links easily to several other mythologies (Scott, 1998). Starting from one reality, understood in a coherent manner by a coherent administrative apparatus, is naturally attractive for those who wish to steer either the apparatus or the reality in a particular direction (Seidl & Becker, 2005). Furthermore, a single- minded reliance on quantitative modelling, goals and indicators of a very synthetic, highly integrated manner, becomes easier to imagine when starting from these assumptions (Hood & Peters, 2004). In that sense, the myth of unity, of absence of bricolage, has positive functions, eg allowing a more smooth continuation of governance, in the belief that there is a coherence, a guiding rationality, a shared knowledge base, and that evidence based decision making can lean on uncontroversial evidence inspiring decisions directly (Gunder & Hillier, 2016).

Our critique of 'the myth' of unitary, centralized steering on the basis of a coherent and shared knowledge base obviously resonates with the vision of Friedrich von Hayek (1945) – and the Austrian school of economics – who argue that the knowledge to run a society is widely distributed and that most of it cannot become available to a central government. Hence, states should not attempt to manage society in detail or decide on a massive redesign of society. The challenge for governance systems – and this goes especially for complex and turbulent environments – is rather to harness and combine the specific knowledges held by different actors or stakeholders (Valentinov, 2021). In contrast to Hayek, we do not believe, however, that the only institutional solution to the broad distribution of knowledge is the price system. Today, complex governance rather requires a comparison of "the heuristic properties of alternative governance structures, such as markets, hybrids, hierarchies, or even non-profit organizations" (Valentinov, 2021, 537). In that sense, our vision is more in tune with contemporary systems theory, which has flat out rejected the idea that there can be a location – be it the market, the state or science - from which society as a whole can be known, controlled and planned and that different, often functionally

equivalent, forms of governance can be used and combined to coordinate different operations directed toward a common goal (e.g. Willke, 2007). Cybernetic systems theory, indeed, emerged in reaction to a mechanistic, Cartesian world view, in its discovery that "even rather simple systems can be, at the same time, exceedingly complex systems" (Pickering, 2010, 29) and its emphasis on the need of systems to continuously adapt to an unknown environment.

The combination of institutional bricolage (Cleaver, 2001) and bricolage of methods and knowledges (Denzin, 2010) does not entail however that these are, separately and in their combination, random processes. Governance might not be predictable, and it might put pressures on knowledge, research and the combination of implied methods which makes the result of that selectivity unpredictable, but governance processes remain structured. While we agree there are some societal and institutional preconditions (e.g. rule systems and monitoring infrastructure, a specified and specific knowledge base, cultural commitment rules, etc.) which allow society to be governed in the first place at all (e.g. Ostrom, 1990), we speak of unique governance paths which are contingent, but partly predictable and partly susceptible to steering (Van Assche et al., 2021b). Methodological bricolage also introduces constraints; not everything is possible, and once a path is chosen, an inherent logic must be adhered to (Kincheloe, 2001).

We will focus particularly on the patterns of knowledges and methods which can emerge in the above-described diversity of governance paths. We develop a typology of different ways to combine methods, which are likely to appear in governance. Particular forms of knowledge, and particular ways of combining knowledge, will appear in a given governance path, and such patterns might be hard to alter (Latour, 2004). While the inherent incoherence of the governance configuration, the result of the path, tends to be systematically overlooked. The perspective offered makes it easier to grasp the attractiveness of (integrated) modeling, simulation, and steering attempts, while it highlights new obstacles for integration of knowledges and of policies, which represent limitations for the (uncritical) use of integrated modeling and simulation in policy.

2. Combining tools and perspectives in governance

In governance, knowledges generally come in through histories of interactions between higher level actors, and their understanding of reality. At least since the 18th century, some forms of expert knowledge where present in administration, so the image of the world formed within administrations was partly shaped by disciplinary experts in their midst. What Foucault called the mathesis, the idea that administration and its experts could create a synthetic yet detailed image of society, as a basis for decision-making, was shared by administrations of various ideological persuasions (Foucault, 2005). Statistics developed rapidly in the 18th century, partly driven by its use in what were then considered centralizing model states -Prussia, Sweden, France (Stigler, 1986).

The idea of synthesis, an accepted need for combining knowledges and methods, became widespread. The accumulation of tasks and topics by administrations, in the formation of the modern nation states, led to an accumulation of knowledges and methods of investigations (Klein, 2017). Sometimes, methods were deliberately combined to deal with a particular problem, and this combination could be institutionalized, turned into an organization. Organizing is also a way of ordering and alignment of the different practices that generate knowledge in an intelligible and usable form, so that organizations can deal with the ever-shifting complexity of their external environment (Amin & Cohendet, 2004).

In this process, complex combinations of knowledges started to look possible and necessary. The world started to look more complex, in a system of politics and administration becoming more intricate (Luhmann, 1990). Specialized knowledges and their methods brought in differences beyond their specialized domain: a specialist on 'X' could represent a different view of the world, of the common good, and he could fight for a more prominent place in decision- making. Foucault himself traced in great detail how topics, objects, subjects and modes of knowing shaped each other over time in governance (eg Foucault, 2007). The genealogies of ways of knowing are the product of an interaction between specific epistemic communities and institutional strategies (cf Scheurich, 2014). How specific models are constructed, for instance, is shaped by the institutional context within which they are created (actors' interests and identities, mix of formal and informal modes of governance, questions raised, etc.) and by the internal rules of the community of experts involved (patterns of problematization, standards of proof, etc.) (Rogers, 2012). Models or simulations are, in other words, value-laden or based on specific assumptions about what should be included in the model and what not, and the path-dependency related to specific governance contexts and modelling methods can legitimate a narrow set of solutions for the problems one is dealing with, while other solutions are made invisible in the models used (e.g. Peeters et al., 2014; Peeters Grietens et al, 2019; Dorin & Joly, 2020).

While adhering with many of the epistemological critiques of specific methods such models and simulations (see also Kuhbandner et.al., in this special issue), we take a different approach here. We acknowledge that specific knowledges and methods have their own limitations and are always subjected to the co-evolutionary pressures analyzed by Foucault but argue that it remains possible to distinguish between several common patterns of combining methods. The resulting typology helps to develop the idea of the double bricolage. In our typology, we distinguish nesting, framing, mixing, specifying, specializing.

2.1. Nesting

One method of combining stems immediately from the growing complexity of governance, its development into multi-level systems. Departments are part of ministries, and local governance is embedded in regional governance. Each scale can be marked by an approach to governance, a way of defining problems, a mix of preferred research methods, and a typical blend of research and other forms of investigation and discussion to figure out what is a fact and which facts count (Pierre, 2019). Even if the organization or the institutions at the different levels have the same targets or goals, the approach will likely be different, the combination of research methods, of approaches to reality different (Alvesson, 2012; Czarniawska, 2014). Nesting can be similar and dissimilar: the approaches can be similar at the different levels, or they can be dissimilar. How much dissimilar they can be hinges on the relation between the levels, on their autonomy: how much independence does a department have? (Fischer & Miller, 2017) A local government? Furthermore, it will depend on the strength of the identity of the level: are the same kind of people and ideas present at the lower level? Is there a vision for the future, for the good society, or for a particular public good, present at the lower level? (Denhardt & Denhardt, 2000) All these issues determine to what extent nesting can be dissimilar. The result of the nesting, of the combination of approaches is influenced by the coupling of the levels: does one have to respond to the other? And in which respect? Even units which can develop strong individual identities in terms of approaches to reality and visions for reality, can be tied to other units, higher or lower, in complex procedures of accountability and of negotiation of knowledges (Luhmann, 2018). In other words, tightly coupled systems can have strong cognitive autonomy, and loosely coupled systems can still be very similar. For Machiavelli, this is the idea of the strong citizen in the strong state, and the idea of autonomously thinking councils which must work very closely with others (Machiavelli, 2020).

It is possible that nesting of methods is tied to a nesting of development approaches, but this is not necessarily the case (Van Assche & Hornidge, 2015; Ferguson, 2003). It is also possible that a clear vision of the future, and methods to move in that direction, is present at one level, while the other level restricts itself to the reproduction of routines, with a more limited ambition level, and less interest in scrutinizing reality to find answers to new questions (Alvesson, 2012; Alvesson & Spicer, 2012). What is nested can, in other words, be approaches to governance, spurring a nesting of research methods, but this is not always true Fig.1.

2.2. Framing

In framing, one approach becomes the precondition of the other one, giving direction. Framing can be spatial, temporal or conceptual.

One spatial scale can force another one to accept some of its points and premises – spatial framing (Neuman, 2000). Nesting will entail stronger framing if the levels are more integrated. In more autonomous relations between levels of governance, the framing will tend to be subtler, and will less likely extend to all three aspects of framing. For temporal framing, a first step in a policy procedure can be obliged to take one approach, after which more diversity can develop, as long as certain procedures are followed (Faludi, 2013). Conceptual framing can refer to a mandatory starting point in the reasoning, after which diversity can emerge (Candel & Biesbroek, 2016).

Framing is not determining, and leaves space for the development and cultivation of diversity in approaches. Framing, as the other forms of combining, can be found in every step of the process of policy formation and implementation (Apthorpe, 1996). Which means that in searching for a definition of key problems, in articulating directions, in implementing policies, plans, laws, there is rarely a situation where the next step follows entirely out of the previous one, where the logic of the framing entirely determines the logic of the framed (cf Luhmann, 1990; 2018). This goes against rational models of implementation, of policy making and administration, but is in line with more critical analyses in administration, policy and planning (eg Fischer, 2019). It should be noted here that conceptual framing is often (if not always) accompanied by a cognitively unconscious process (Lakoff & Johson, 1999), which shapes basic orientations and learning cycles. In management the term "wayfinding" was advanced by Robert Chia (2017) to describe the underlying, non-cognitive variety of organizational learning, which does not rest solely on the deliberate, cognitive storage and processing of information, but always also on the managers' "immersive engagement" with their social environment (Valentinov & Perez-Valls, 2021).

As with the other forms of combining, framing can be found at the level of visions and approaches, at the level of institutions (some of them embodying visions), and at the level of the approaches to reality, or research methods employed (Daviter, 2007). An innovation model to agriculture at regional level might coexist with local pockets of organic small-scale farming still taking on board some of the premises of the innovation model, associated with existing expertise and incentives; a regional plan can frame a regional



Fig. 1. Nesting of knowledge and method in policy in multi-level governance.



Fig. 2. Types of framing. Knowledge and perspectives shapes what is to come.

environmental policy and economic policy, while the mix of sociological and geographical methods of the regional plan can set the tone (frame) for the ecological and other methods of the policy.

Conceptual framing can be tight or loose, by which we mean that, in the case of tight framing, large parts of the conceptual frame of the framing method or institution are taken over by the framed, many assumptions, concepts and relations (Alvesson & Spicer, 2012). While for the loose framing, only a few assumptions are taken over and influence the course of investigation and of governance. Organizational cultures make all the difference in this regard (Czarniawska, 2014). If spatial, conceptual and temporal framing combine, there is likely a tight form of framing, where it looks like B indeed follows logically from A. In social systems terms, one can speak of de-paradoxification (Seidl, 2007) Figs. 2 and 3.

2.3. Specifying and specializing

This is the relation between two policies or methods where one is the subspecies of the others, a tightly coupled form of framing, where the next step, the lower level, or the conceptual detailing is an application, a further articulation of the principles in the first policy in the second one. Which means that most concepts and assumptions of the framing institution or method are taken over, but further developed. This specifying sometimes but not necessarily takes the form of specializing. For specialization, the perspective is applied to a particular domain (Renschler et al., 2007). Specification can be any form of further development, eg. where some lines of reasoning, some concepts, some aspects of the method are further developed (Derkatch, 2008; Alvesson & Sköldberg, 2017). In a particular governance configuration, specialization can lead to different parts of the organization adopting a similar approach, yet applied to different domains (water, waste, etc).

A specification in terms of policies framing each other is not necessarily a specification in terms of the research methods applied. It remains possible that the same methods are used in the framing and the framed, the specifying and the specified. If, however, the method of investigation follows closely from the perspective embodied in the policy, then a specification of policy will likely lead to a specification of research method (Mingers, 2001).

2.4. Mixing

Mixing is the most general concept. It refers to any combination of dissimilar elements in approaches, institutions, and research methods (cf Howlett & Rayner, 2007). Mixing is always possible, and always happens, but in each governance configuration it is subjected to different pressures and restrictions. Loosely coupled governance systems, loosely coupled institutions and scales will allow for more diverse forms of mixing than others (Swenson, 2018). Centralized systems and systems dominated by a shared ideology and



Fig. 3. Nesting and framing related.



Fig. 4. A more general typology of combining knowledges and methods in governance.

shared epistemology, or dominated by one form of expertise, will show and allow for less variation in mixing. In some systems, slight mixing will be perceived as straying from the facts, while in others, the facts guiding policy and planning will be understood as necessarily composite, deriving from different methods, consisting of diverse elements (Dow, 2008) Fig.4.

3. Couplings, boundaries and travels

In this section, we reflect on the possibilities and limits of combination and give the concepts of boundaries and couplings central place in this reflection.

Methods are coupled to disciplines, topics, theories, concepts and sometimes ideologies to very different degrees (Roth et al., 2021). Some disciplines identify strongly with a set of methods, others much less so, and some theories (say psycho-analysis or neo-classical economics) also have a much stronger association with particular methods than others (Dow, 2008; Latour, 2004; Van Assche et al., 2019). Similarly, some methods are strongly associated with a particular epistemology or ontology than others (Van Assche et al., 2021a, 2021b). Grounded theory assumes it is possible to have no assumptions, while the omnipresence of assumptions is the starting point for Foucaultian discourse analysis (Foucault, 2013). Concepts like rationality are tightly coupled to the frame of neo-classical economics, and to the ideology of society as a collection of rational individuals optimizing their well-being (Flyvbjerg, 2001). An-thropology and geography were theoretically closed for a long time, yet opened and diverged considerably in recent decades, while theories developed in one discipline might become marginal in their land of birth but colonize new territories: think Deleuzian philosophy becoming prominent outside philosophy, and the same happening to Lacanian psycho-analysis (De Vries, 2007).

As research projects are often complex and topics are not easy to place within any one discipline, methods which are developed in one discipline (e.g. anthropological ethnography) sometimes 'travel' or circulate to another disciplinary context; while doing so various concepts, discourses, theories and topics which are linked to the method travel with it (Bal & Marx-MacDonald, 2002). This travelling of methods (and the related concepts and discourses linked) is shaped by the type of (disciplinary) boundaries encountered. If disciplines define around a topic, the boundaries might be more open for traveling methods; if they define around a set of methods or around a group of individuals or organizations maintaining their own status quo or hierarchy, this tends to keep out new ideas and methods of those at the top identify most strongly with a set of methods (Derkatch, 2008; Renschler et al., 2007). If there is a hierarchy in concepts or topics within the discipline, the methods closer to those topics will rank higher, offer more opportunities for advancement (Flyvbjerg, 2006). If methods are tightly coupled to a theory, then incompatible theories will less likely be served by that method; it will less likely travel there (Van Assche et al., 2021a, 2021b).

Combining methods thus becomes more or less likely given these patterns of boundaries, couplings and travels (cf Feilzer, 2010). In a purely academic setting, which can include the study of governance, these mechanisms will be dominant (Fox & Miller, 2015; Fischer, 2019), but in a governance setting, other boundaries etc will come into play, as we know from the previous sections. In an academic setting, composite methods, a bricolage of methods, umbrella methods, coupled methods, all of which can be categorized through our modes of combination (nesting etc.), will have to meet requirements of cohesion and consistency, even if deep scrutiny of compatibility of assumptions isn't always possible (Kothari, 2004; Mingers, 2001). Research projects have work packages which cross disciplines and combine methods. 'Fieldwork' can include data collection for quantitative analysis later, as well as observation, sketching interviews, data collection for historical methods later, etc (Cameron & Forrester, 2014).

In governance, the use of expertise is subjected to different pressures (see above), leading to a different selectivity, to different demands on cohesion and different possibilities to render the bricolage for forms of knowledge cohesive. The boundaries and travels of the academic field do play out however, in a more complex interaction with the two other sets of boundaries encountered before: between perspectives and between institutions. Methods of investigation travel between perspectives on good governance and the good community (Yanow, 2007; Wagenaar, 2014; Cameron & Forrester, 2014). And they travel between institutions, which can include highly composite institutions such as long -term strategies, development frameworks, economic development plans, etc., but also between more modest and narrowly defined institutions such as assessment and impact tools (Hezri & Dovers, 2006; Hajer et al., 2003).

Thus, if we keep in mind that, in governance

- (a) Perspectives on governance are combined
- (b) Institutions are combined and
- (c) Forms of knowledge and their methods are combined

And that these combinations are shaped and limited by

- (a) Traveling perspectives, institutions, knowledges and methods
- (b) The boundaries within one policy domain (methods, perspectives and institutions)
- (c) The boundaries between domains
- (d) The couplings between domains (tight and loose)

Then the image of knowledge creation and knowledge travel in governance becomes more complex. Nesting of perspectives in governance will hinge on the compatibility of these perspectives, but also on the relative autonomy of units or levels and the demands on compatibility there. Nesting of institutions, within eg strategies coordinating and integrating a variety of plans, policies, laws, is possible, and the degrees of freedom depend on the cohesion of the strategy and the freedom of the players coordinated (Seidl, 2007; Kornberger, 2012). Nesting of methods in research is, as said, more subjected to scrutiny of cohesion in assumptions, but also within the academic field, degrees of freedom differ, according to the connectivity of the method to concepts, topics, theories (see above, and see Eco & Sebeok, 1988). The same applies to the other forms of combination. Boundaries shape interaction and travel of ideas and institutions, but do not exclude it (Bal & Marx-MacDonald, 2002). Boundary work and boundary crossing remain possible, while research methods can enable boundary crossing (Kerosuo & Engeström, 2003; Mollinga, 2010), yet the presence of boundaries needs to be grasped in order to grasp the patterns of mobilities, and the possibilities of combining knowledges and methods.

Choices in perspective within governance will affect the choices of institution and the choices of knowledge and associated method. These influences will differ depending on the coupling of perspective and institution and institution and knowledge/method. Governance systems geared towards ambitious visioning, ambitious in terms of comprehensiveness of topics, long term, and large scale, will be more used to combining and integrating knowledges, and insist on consistency (O'Hara, 2006). The general perspective on governance (as enabling comprehensive visions for the common good) thus creates space for many sorts of knowledge, many combinations, and, most likely, also a pressure towards cohesion (Keeley & Scoones, 2000). In models marked by a localist, or minimalist, or neo- liberal ideology, or systems of a more ad hoc nature, a collage of responses to older problems and preoccupations, certain topics will be densely populated by experts and their methods, others less so, and the cohesion will be less important (Chacón et al., 2011).

In general, one can say that certain models (discourses, narrative ideals, perspectives) of and on governance will be tightly coupled to particular perspectives on domains of governance (say, socialism on economic development), and the presence of particular forms of knowledge there (engineering thinking in economic development). For others this is less the case. Certain models of democracy tend to produce certain sets of institutions (some favoring planning, others not), and some institutions have preferential links with particular forms of knowledge (eg ecological plans and ecological knowledge) while others are much more open (Voß & Freeman, 2016; Knorr Cetina, 2007).

The complexity of knowledge use and production in governance, within this complex map of couplings, boundaries and flows immediately points out that a normative model of knowledge in governance cannot be taken too seriously (Grindle, 2017). An optimal form of 'knowledge management' in governance, or a perfect manner of inclusion of perspectives cannot be formulated (Alvesson et al., 2002). There are only governance paths marked by their own knowledge use and production (Van Assche et al., 2013, 2017, 2021c). It also points at the great difficulties encountered when redesigning governance systems and their knowledge management (Easterly, 2008).

This complexity, mapped in the proposed way, limits the claims of knowledge integration which are often behind claims of policy integration. Such claims tend to rely on integrated modeling and simulation which ignores its own selectivity and the limits to integration between combined indicators (Peeters et al., 2014). The myths of organizational and cognitive unity (unity of the world and unity of governance) render policy integration and knowledge integration easier and buttress the belief in integrated modeling and simulation exercises. These exercises rely on assumptions of shared semantics, shared ontologies, and shared coordination power (van Beek et al., 2020). If we understand the bricolage of knowledges and institutions in governance in the way proposed, with unique sets of rigidities and flexibilities in the knowledge management for each governance system, then the eyed synthesis through quantification and modeling becomes harder (Le Bourhis, 2016). One can be more precise and point at the unique sets of combination rules and traditions for both knowledges and institutions, for each governance system.

Each governance system will tend to favor different forms of nesting, framing, mixing, specifying and specializing institutions and knowledges, depending on structure, history, and the prevalence of particular perspectives on governance and community (Van Assche & Hornidge, 2015). Understanding governance paths is useful to map out existing forms of knowledge production and their evolution, as well as grasping possibilities for transformation (Knorr Cetina, 2007). New knowledge can transform governance and new governance will affect knowledge inside and outside governance (Voß & Bornemann, 2011).

The choice and possible combinations of research methods tend to come late in processes of governance (Boswell, 2008). Sometimes, they will be predetermined, given their institutional embedding (Latour, 2004). In theory, they come late in processes of recognition of relevant topics, problems, possible solutions (Katsamunska, 2012; Rochefort & Cobb, 1993). In adaptive systems, marked by strong iterative processes of analysis, methods can be reapplied in the same process. In systems marked by multiple perspectives and strong checks and balances, methods associated with competing theories, disciplines, or able to produce competing results, can have a less disputed place (Shields, 2003). In some cases, particularly complex governance tools (such as comprehensive and long-term plans and strategies, or of multi-level integrated water management) can become engrained and become part of the identity: we cling to land use plans and their embedded research, even if we know they don't work well (Grant, 2009).

Nesting of research methods in governance, in our perspective, is thus possible directly, through umbrella methods including others



Fig. 5. An example: A chain of interpretive operations leads to the return of the repressed, ie. the return of an initially rejected policy option inspired by an urban expansion process in the Netherlands.

(scenario methods, mapping methods, etc), and it can happen indirectly, by institutions at a higher level in governance deploying method A and institutions at lower level leaning on method B. Indirect nesting can introduce looser couplings between the methods, as it likely emerges in a situation of looser couplings between institutions and between perspectives.

Framing becomes quite interesting in this perspective, as a method, and certainly the interpretation of its results, will be necessarily framed by many things (Gunder & Hillier, 2016). Methods can and will indeed frame other methods, in spatial, temporal, and conceptual sense. And they will be framed by perspectives and institutions, at the same and higher levels of governance. The chain of framing can be long and intricate: a perspective on good governance can frame an institution, which can frame a method, which can frame a different institution, etc. As for Peircean semiotics, interpretation never ends here, and the methodic episodes in governance can be seen as episodes where more demands are placed on the cohesion of knowledge production and the capacity to link with other knowledges, of the same or different sorts (Eco & Sebeok, 1988; Luhmann, 1995). Tight couplings between methods can be cherished for a while because policy integration and comprehensive policy seem necessary and persuasive, yet these couplings can disintegrate when beliefs in synthesis erode, when alliances fall apart, or when professional identities, marked by clear methodological boundaries, reassert themselves (Bowles, 1974). Methods in governance can focus knowledge inclusion, use and production for a while, after which more knowledges come in, more diverse and disconnected production of knowledge is allowed, looser interpretation, until a question, topic or goal arises, with either actual agreement or tradition asking for more methodical, focused, selective, integrated knowledge. This can be a call for truth of certainty in some cases, or a redefinition of truth and certainty in others (Richardson, 1996).

Specializing and specifying of research methods can happen in chains of command, in complex institutions involving long processes of policy preparation, articulation, assessment, and, more generally, in complex administrative structures with methods adopted at the top leading to specified and specialized methods at lower levels (Luhmann, 1990). As hinted at before, this depends again on the autonomy of lower levels, and on sharing of perspectives between parts and levels of administration (Kornberger, 2012; Czarniawska, 2014). Processes of specializing or specifying intuitively seem like defining smaller domains of reality to apply more reductive methods, but this is not always the case. Specification can also mean reflection on previously unobserved features and connection. Seeing new detail can open perspectives and routes for traveling concepts, theories and methods. Thinking about pollution can start from chemistry and lead over ecology to the study of minuscule critters (Latour, 2004) Fig. 5.

4. Concluding: incoherence, multiplicity, and bricolage revisited

We return to the idea of bricolage, as dealing with contingency, as dealing with the ever-present imperfection of governance and its tools, with limited cohesion and rationality, and very simply dealing with the tools at hand when managing a situation, taking a decision (cf Rogers, 2012; Sehring, 2009). Those tools are partly a product of history, of the evolution of the governance system itself, and they include both cognitive and organizational tools, the concepts, narratives, expert frames, and ideologies which enable us to understand governance and its environment. Bricolage takes places at different levels and segments of governance; it is a matter of piecing together knowledges to deal with issues, and piecing together tools of organization (Cleaver, 2001).

We distinguished several patterns of bricolage which are common in governance systems, categories which can be recognized at the different levels distinguished: institutions, knowledges and their methods, and perspectives on governance and community. We spoke of nesting, framing, specializing and specifying, and, as most general term, mixing. What is presented as unified, and what is presented as tightly coupled and entirely driven by formal institutions, is usually not so, but not so in unique ways, marked by unique distinctions between units and levels, unique combinations of knowledges present and active in the system (cf Desa, 2012).

This means that, in a relatively autonomous, loosely coupled environment, new perspectives can develop, new institutions, new ideas on which knowledge is needed, new knowledge, new methods to create that knowledge and new manners of combining methods (Alvesson & Sandberg, 2013). It also means that, in environments where the experts are given power, eg towards comprehensive forms of policy, more complex forms of nesting, framing, etc, in longer chains, and more complex patterning can develop (Scott, 1998). In

governance systems marked by intense interactions between particular actors, where they have to respond to each other frequently and substantially, it is less likely that islands of tightly coupled, stable, and complex patterned forms of knowledge develop (Luhmann, 1995). Specialization can mean a focus on one existing field of expert knowledge and its methods, but in governance systems it can also mean that new methods and new combinations arise (Hajer et al., 2003; Hood & Peters, 2004).

In radically localized, and radically participatory systems of governance, expert and lay knowledges can be combined in different ways. Lay knowledge can be foregrounded as in the case of citizens' juries or 'negotiated rule making' exercises in which ordinary citizens are selected to represent to public, while other participatory modes of governance rather foreground expert knowledge and methods, as in the case of the Delphi Technique, a widely used method of gathering group consensus from a panel of experts (Bucchi & Neresini, 2008).

Nowadays, there are also ample participatory governance initiatives that adopt an explicitly experimental orientation in domains such as urban planning, environmental management, and public health; by using collaborative mapping tools, for instance, local and lay audiences are invited to engage with technical, scientific, or planning matters that used to be the preserve of experts (Lezaun et al., 2017). In such cases, expert knowledge and methods might not be excluded, but they will less likely be institutionalized in stable manners; by using more experimental and collaborative tools the boundaries of traditional ways of performing democratic governance are pushed in ways which allow for complex patterns of nesting, framing, etc. Sometimes such periods of intense interaction and participation create a pattern of knowledges and methods which can become institutionalized and develops more autonomously from there (Van Assche & Hornidge, 2015). Each of these pathways has pros and cons and must be judged on its merits under its own circumstances.

It is the context of such patterned knowledges and institutions, with sometimes tight and sometimes loose couplings between parts of the mosaic, and the context of evolutionary pathways of governance systems, creating those hard and soft boundaries between knowledges, that needs to be understood better when integrating modeling and simulation exercises in policy and administration.

Research methods for, and especially in governance cannot be understood in isolation, that is, as tools to directly answer questions which are understood as neutral, and referring to issues, topics, problems that are supposed to be neutral (Fischer & Miller, 2017). Research methods produce facts which are recognized as facts in governance only when they fit the patterns of knowledge production and use in the governance system (Beunen et al, 2015), and those patterns are linked to the understanding of reality, of topics, problems and solutions which make sense in the governance system (while other evidence seems to lack 'facticity'). Such governance system, as we have argued, is better seen to contain a multiplicity of perspectives, knowledges and methods; we have described this as a bricolage in a double sense, allowing for some patterns of combining methods, and with that, for synthetic and comprehensive forms of modeling and simulation. In this way, our article highlighted the need for epistemic plurality and the need to reflect seriously on the different ways of combining research methods in governance.

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